Title:	Microwave-Assisted Fabrication of Titanium Implants with Controlled Surface Topography for Rapid Bone Healing
Type:	Article
Source (ISSN):	ACS APPLIED MATERIALS & INTERFACES (1944-8244)
Status:	A paid open access option is available for this journal.
Author:	Kutty, MG; De, A; Bhaduri, SB; Yaghoubi, A
Volume (Issue):	16(6): 13587-13593
DOI:	10.1021/am502967n
Abstract:	Morphological surface modifications have been reported to enhance the performance of biomedical implants. However, current methods of introducing graded porosity involves postprocessing techniques that lead to formation of microcracks, delamination, loss of fatigue strength, and, overall, poor mechanical properties. To address these issues, we developed a microwave sintering procedure whereby pure titanium powder can be readily densified into implants with graded porosity in a single step. Using this approach, surface topography of implants can be closely controlled to have a distinctive combination of surface area, pore size, and surface roughness. In this study, the effect of various surface topographies on in vitro response of neonatal rat calvarial osteoblast in terms of attachment and proliferation is studied. Certain graded surfaces nearly double the chance of cell viability in early stages (similar to one month) and are therefore expected to

	improve the rate of healing. On the other hand, while the osteoblast morphology significantly differs in each sample at different periods, there is no straightforward correlation between early proliferation and quantitative surface parameters such as average roughness or surface area. This indicates that the nature of cell-surface interactions likely depends on other factors, including spatial parameters.
Keyword:	bone tissue engineering; surface porosity; roughness; microwave sintering; cell proliferation; osteoblast; porous-coated ti-6al-4v; dental implants; fatigue-strength; oxide thickness; roughness; cells; osseointegration; proliferation; osteoblasts; differentiation
Related URL:	http://pubs.acs.org/doi/abs/10.1021/am502967n